

Claims

1. A thin film magnetic recording head for perpendicular recording comprising:
a main pole piece that extends to an air-bearing surface;
5 a return pole piece that extends to the air-bearing surface;
a shield structure of ferromagnetic material extending along the air-bearing surface near the main pole piece, the shield structure confronting the main pole piece to form a write gap on an opposite side of the main pole piece from the return pole piece; and
10 first and second connecting studs of ferromagnetic material extending from the shield structure to the return pole piece.

2. The thin film magnetic recording head of claim 1 wherein the shield structure includes a trailing shield and left and right side shields.

3. The thin film magnetic recording head of claim 2 wherein the first and second connecting studs are symmetrically disposed on opposite sides of the main pole piece and the minimum distance between the shield structure and the main pole piece is substantially smaller than the minimum distance between the first
20 connecting stud and the main pole piece.

4. The thin film magnetic recording head of claim 3 wherein the shield structure has a first thickness orthogonal to the air-bearing surface near the main pole piece, the main pole piece has a tip at the air-bearing surface and the first
25 thickness is less than a length of the tip.

5. The thin film magnetic recording head of claim 4 wherein the connecting studs have a second thickness orthogonal to the air-bearing surface and the second thickness is greater than the first thickness.

6. The thin film magnetic recording head of claim 1 wherein the shield structure is narrower than the return pole piece in a cross-track direction, the first and second connecting studs are symmetrically disposed on opposite sides of the main pole piece and extend orthogonally from outer edges of the shield structure to contact to the return pole piece.

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7. The thin film magnetic recording head of claim 1 wherein the first and second connecting studs are recessed from the air-bearing surface and non-magnetic material separates the connecting studs from the air-bearing surface.

8. A thin film magnetic recording head for perpendicular recording comprising:
a main pole piece that extends to an air-bearing surface;
a return pole piece that extends to the air-bearing surface;
a shield structure of ferromagnetic material extending along the air-bearing surface near the main pole piece, the shield structure including a trailing shield and left and right side shields, the trailing shield confronting the main pole piece to form a write gap; and
first and second connecting studs of ferromagnetic material extending from the shield structure to the return pole piece and being symmetrically disposed on opposite sides of a center line through the main pole piece.

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9. The thin film magnetic recording head of claim 8 wherein first and second connecting studs are located away from the main pole piece to reduce the flux flow from the main pole piece to the connecting studs.

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10. The thin film magnetic recording head of claim 8 wherein the shield structure has a first thickness orthogonal to the air-bearing surface near the main pole piece, the main pole piece has a tip at the air-bearing surface and the first thickness is less than a length of the tip.

11. The thin film magnetic recording head of claim 10 wherein the connecting studs have a second thickness orthogonal to the air-bearing surface and the second thickness is greater than the first thickness.

5 12. The thin film magnetic recording head of claim 8 wherein the shield structure is narrower than the return pole piece in a cross-track direction, the first and second connecting studs extend orthogonally from outer edges of the shield structure to contact to the return pole piece at symmetrical positions and the distance between the first and second connecting studs is less than half of a
10 width of the return pole piece a cross-track direction.

13. The thin film magnetic recording head of claim 8 wherein the first and second connecting studs are recessed from the air-bearing surface and non-magnetic material separates the connecting studs from the air-bearing surface.

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14. A thin film magnetic recording head for perpendicular recording comprising:
a main pole piece with a tip that extends to an air-bearing surface;
a return pole piece that extends to the air-bearing surface;
a shield structure of ferromagnetic material extending along the air-
20 bearing surface near the main pole piece tip, the shield structure including a trailing shield and left and right side shields, the trailing shield being disposed on an opposite side of the main pole piece tip from the return pole piece, the trailing shield confronting the main pole piece to form a write gap, the shield structure being narrower than the return pole piece in a cross-track direction and the shield
25 structure having a thickness near the main pole piece tip that is less than a length of main pole piece tip; and
first and second connecting studs of ferromagnetic material extending from first and second outer ends of the shield structure to the return pole piece, being symmetrically disposed on opposite sides of a center line through the main
30 pole piece and having a thickness which is greater than the thickness of the shield structure near the main pole piece tip.

15. The thin film magnetic recording head of claim 14 wherein first and second connecting studs are located away from the main pole piece to reduce the flux flow from the main pole piece to the connecting studs.

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16. The thin film magnetic recording head of claim 14 wherein the first and second connecting studs are recessed from the air-bearing surface and non-magnetic material separates the connecting studs from the air-bearing surface.